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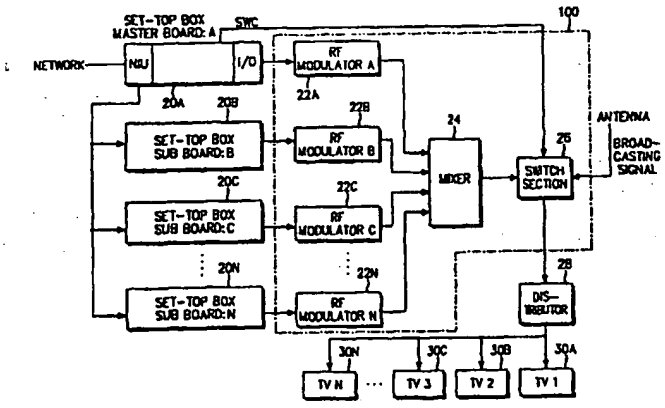
(54) Title: HOME NETWORK SYSTEM FOR TWO-WAY MULTIMEDIA SERVICE



(57) Abstract: Disclosed is a home network system to which a network is connected through one transmission media for a two-way multimedia service, wherein the system comprising: a plurality of display units each installed inside a house; a plurality of user equipment boards for processing service contents applied through a transmission media to provide the processed service contents to the plurality of display units; a plurality of RF modulators coupled to the plurality of user equipment boards, adapted to modulate signals indicative of the service contents outputted from the plurality of user equipment boards at different channel frequency bands designated to the respective channels of a plurality of display units to output the channel-modulated service contents signals thereto; and, a mixer coupled to each of the plurality of the RF modulators, adapted to mix the channel-modulated service content signals outputted from the plurality of RF modulators for application to the plurality of display units.

WO 01/05097 A1

HOME NETWORK SYSTEM FOR TWO-WAY MULTIMEDIA SERVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention generally relates to a two-way multimedia service, and more particularly to a home network system for interacting with a plurality of television sets through a multi-channel modulation scheme.

2. Description of the Related Art

A typical example of a two-way multimedia service is a "Video On Demand" service (hereinafter referred to as "VOD service"). The VOD service allows subscribers to watch a desired program by placing an order at any time. Thus, the subscribers are not required to watch a particular program as dictated by the broadcaster according to a fixed schedule. The VOD service provides more than a movie, and it includes other programs including the replay of a recently televised TV program, such as an educational TV program, a sports TV program, etc.. Accordingly, the VOD service requires the provider of the program contents to provide the requested image information and network service in distributing the information to the subscriber.

FIG. 1 illustrates the elements of the VOD system, which includes a server having an input server 4, an application server 6, a network 8, and a plurality of set-top boxes 10. The variety of image information contained in a video tape 2, which is provided by the contents provider, is inputted to the application server 6 via the input server 4. The application server 6 stores the inputted image information, and an application software for controlling the image information is used to selectively transmit the image information to a final user equipment (i.e., a set-top box known as an indoor satellite broadcast receiver) as requested by the final user. The network 8, which includes a core network, a node access, and an access network, should be a broadband network that can transmit information in the unit of several Mbps. Various transmitting media, such as an optical fiber, coaxial cable, telephone wire, satellite transmission, etc., can be used to transmit to/from the core network 8. Similarly, a request from the final user, via a remote control, is transmitted to the application server 6 via the network 8. The set-top box 10 is normally installed within the user's home so that it can act as a terminal station for controlling the broadband transmission path, for decoding the digital information to be viewed on the TV screen, and for executing several other applications.

A number of television stations available in a home or office environment have increased in the past. However, if a user wishes to enjoy the two-way multimedia service, such as the VOD service, through each of the television sets in his or her home, each television set has to be equipped with its own set-top box. Presently, there is no single set-top box available for controlling the number of television sets to present the VOD service.

In most developed countries, a typical household has an average of 2.8 television sets. There is a need, therefore, for implementing a single set-top box to control at least 3 television sets simultaneously.

SUMMARY OF THE INVENTION

The present invention has been made in an effort to solve the problems occurring in the prior art, and an object of the present invention is to provide a home network system having a single set-top box to simultaneously control a plurality of display devices.

It is another object of the invention to provide a home network system that can supply, simultaneously, a plurality of display devices with the service contents provided from a network using a multichannel modulation technique.

In order to achieve the above object, according to the present invention, a remote control device coupled to a network for controlling the multi-media information presented to a viewer in a plurality of display units is provided, wherein the device includes: a plurality of set-top boxes coupled to the remote control device for converting signals received via a transmission media into corresponding service content signals; a plurality of RF modulators coupled to the plurality of set-top boxes for modulating the converted service content signals at different channel frequency bands, wherein the different channel frequency corresponds to the respective display unit; a mixer coupled to each of the RF modulators for mixing the modulated signals from the plurality of RF modulators to be applied to the plurality of display units; a switch coupled to the mixer for selectively selecting the output signal from the mixer or a broadcasting signal received via an antenna responsive to a request made by a user; and, a distributor coupled to the switch for distributing the output signal from the switch to the plurality of display units.

According to one aspect of the present invention, the RF modulators, the mixing means, and the switching means are disposed in a single unit.

According to another aspect of the present invention, the set-top box boards include
a set-top box master board coupled to the network via the transmission media and a plurality of set-top box sub boards each coupled to the set-top box master board.

According to another aspect of the present invention, the set-top box master board interfaces with the user for selectively controlling the output signals of the switching means.

According to a further aspect of the present invention, the set-top box board demodulates the signals from the network using a Carrierless Amplitude Phase Modulation (CAP) method and modulates an upstream signal using a Quadrature Phase Shift Keying (QPSK) method.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, features, and advantages of the present invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings in which:

Fig. 1 is a schematic system diagram illustrating the construction of a VOD (Video On Demand) system;

Fig. 2 is a schematic block diagram illustrating the construction of a home network system according to the preferred embodiment of the present invention; and,

Fig. 3 is a schematic block diagram illustrating the construction of a set-top box master board shown in Fig. 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference will now be made in greater detail to the preferred embodiments of the present invention. In the drawings, the same or similar elements are denoted by the

same reference numerals even though they are depicted in different drawings. For the purpose of clarity, a detailed description of known functions and configurations incorporated herein will be omitted as they may make the subject matter of the present invention unclear.

Fig. 2 is a schematic block diagram illustrating the construction of a home network system according to the preferred embodiment of the present invention.

With reference to Fig. 2, a set-top box includes a set-top box master board 20A and a plurality of sub set-top box boards 20B,..., 20N. Each of the set-top box boards can be easily mounted/dismounted to/from a set-top box similar to the characteristic of the module card of a personal computer (PC). The total number of set-top box master board 20A and set-top box sub boards 20B,..., 20N mounted on the set-top box corresponds to the total number of display units 30A, 30B, ..., 30N. For an example, if the number of display units included in the home network system is 5, the total number of the set-top box master board 20A and the set-top box sub boards 20B,..., 20N mounted on the set-top box is 5.

The set-top box master board 20A is coupled to a network via a transmission media, such as optical fiber, coaxial, spiral pair cable (a telephone wire), satellite transmission, etc., and each of the plurality of set-top box sub boards 20B,..., 20N is connected to a Network Interface Unit (NIU) of the set-top box master board 20A.

Fig. 3 is a schematic block diagram illustrating the inner construction of the set-top box master board 20A as shown in Fig. 2.

With reference to Fig. 3, the set-top box master board 20A comprises a microprocessor 32, a memory 34, a Network Interface Unit (NIU) 36, a Moving Picture Experts Group (MPEG) decoder 38, an audio and video output section 40, an input/output section (I/O) 42, and a user interface section 44. The microprocessor 32 controls the overall operation of the set-top box master board 20A. The memory 34 includes a Read Only Memory (ROM) and a Random Access Memory (RAM). Various control programs of the microprocessor 32 are mapped in the ROM and various other control signals and data are stored/readout in/from the RAM under the control of the microprocessor 32. The NIU 36 is connected to the network through a transmission media, such as a telephone line or optical cable, and it modulates and demodulates signals transmitted and received between the network and the MPEG decoder 38 and

outputs the modulated or demodulated signals therefrom.

More particularly, the NIU 36 consists of a transmitter and a receiver. The receiver demodulates the MPEG data stream inputted from the network via the transmission media using a Carrierless Amplitude modulation Phase modulation (CAP)-16 method and outputs the demodulated MPEG data stream to the MPEG decoder 38. In reverse, the transmitter modulates data during an upstream operation using a Quadrature Phase Shift Keying (QPSK) method and outputs the modulated data to the network via the transmission media.

The MPEG decoder 38 is controlled by the microprocessor 32 and decodes the demodulated MPEG data stream received from the NIU 36, then transmits the decoded MPEG data stream as an audio data and a video data to the audio and video output section 40. The video output section of the audio and video output section 40 converts digital video signals processed by the MPEG decoder 38 into corresponding analog video signals and outputs the converted analog video signals to an external display unit via the I/O section 42 (i.e., an Audio/Visual (A/V) jack). On the other hand, the audio output section of the audio and video output section 40 converts digital audio signals processed by the MPEG decoder 38 into corresponding analog audio signals, while amplifying the converted analog audio signal to be applied to the external display unit via the I/O section 42, (i.e., an Audio/Visual (A/V) jack). The user interface section 44 is a circuit for interfacing with the user which includes a remote control with a key input.

The set-top box sub boards 20B, 20C,..., 20N are configured to have the same configuration as the set-top box master board 20A, but do not include the NIU 36 and the user interface 44 as shown in Fig. 3. Thus, a discussion of similar components is omitted for redundancy, with an exception that a microprocessor 32 included in each of the set-top box sub boards 20B, 20C,..., 20N is mutually in communication with the microprocessor 32 of the set-top box master board 20A, and performs the respective intrinsic operations under the control of the microprocessor 32 of the set-top box master board 20A. Also, with reference to Fig. 2, the set-top box master board 20A and the set-top box sub boards 20B, 20C, ..., 20N are connected to the respective RF modulators 22A, 22B, ..., 22N in such a manner that each of the set-top box master and sub boards 20A, 20B, 20C, ..., 20N corresponds to one of the associated RF modulators 22A, 22B, ..., 22N. For simplicity, each of the signals outputted from the set-top box master board 20A and the set-top box sub boards 20B, 20C, ..., 20N is hereinafter referred to as "SERVICE CONTENT SIGNALS".

The RF modulators 22A, 22B, ..., 22N modulate the respective SERVICE CONTENT SIGNALS outputted from the set-top box master board 20A and the set-top box sub boards 20B, 20C, ..., 20N at different channel frequency bands allocated to each channel of the respective display units 30A, 30B, ..., 30N, as shown in Fig. 2. The RF modulators transmit the respectively modulated SERVICE CONTENT SIGNALS to a mixer 24. The mixer 24 mixes the channel-modulated SERVICE CONTENT SIGNALS outputted from the RF modulators 22A, 22B, ..., 22N together to be applied to a switching section 26. The switching section 26 selects either the regular broadcasting signals received via an antenna or the output signals from the mixer 24 to the display units according to a switch control signal SWC received from the microprocessor 32 of the set-top box master board 20A, wherein the switch control signal is used to select a certain channel in response to a request made by the user. Thereafter, the switched or selected signals are transmitted to a distributor 28. The distributor 28 distributes the output signals from the switching section 26 to a plurality of television sets 30A, 30B, ..., 30N, respectively.

Preferably, a block denoted by a reference numeral 100 in Fig. 2, which comprises the plurality of RF modulators 22A, 22B, ..., 22N, the mixer 24, and the switching section 26, is implemented in a single pack 100. The implementation of the block 100 enhances economical usefulness.

Now, an explanation of the operation according to the embodiment of the present invention will be given in more detail hereinafter with reference to Figs. 2 and 3.

When the NIU 36 of the set-top box master board 20A receives service content data (a digital broadcasting signal, Internet data, VOD data, etc.) from the network via a transmission media, such as optical fiber, coaxial, spiral pair cable (a telephone wire), and satellite transmission, the NIU 36 demodulates the received service content data. Then, the NIU 36 supplies the demodulated service content data to both the MPEG decoder 38 of the set-top box master board and the set-top box sub boards 20B, 20C, ..., 20N.

The constituent elements of the set-top box master board 20A and the set-top box sub boards 20B, 20C, ..., 20N associated with Fig. 3 are performed to produce the service content signals. Thereafter, the set-top box master board 20A and the set-top box sub boards 20B, 20C, ..., 20N supply the SERVICE CONTENT SIGNALS to the

RF modulators 22A, 22B, ..., 22N, respectively. At this point, the SERVICE CONTENT SIGNALS are in the form of an analog signal and can be classified as a video signal, audio signal, and text signal. Each of the RF modulators 22A, 22B, ..., 22N modulates the SERVICE CONTENT SIGNALS outputted from the set-top box master board 20A and the set-top box sub boards 20B, 20C, ..., 20N at different channel frequency bands which are allocated to each channel of the respective television sets 30A, 30B, ..., 30N. Then, the modulated service content signals at respective frequency channels are applied to the mixer 24. For example, the modulated frequency of a channel A of the RF modulator 22A can be set to 55.25 MHz, the modulated frequency of a channel B of the RF modulator 22B to 67.25 MHz, the modulated frequency of a channel C of the RF modulator 22C to 73.25 MHz, ..., a modulated frequency of a channel N of the RF modulator 22N to 135.25 MHz, respectively. For an NTSC broadcasting system, when considering that the modulated frequency from the RF modulator is outputted to 3-channels (image carrier frequency: 61.25 MHz) or 4-channels (image carrier frequency: 67.25 MHz), each of the channel frequencies can be applied as set forth under the NTSC system.

The mixer 24 mixes together the respective modulated SERVICE CONTENT SIGNALS outputted from the RF modulators 22A, 22B, ..., 22N to be applied to the switching section 26. At this time, the frequency bands outputted from the mixer 24 will range from 54 MHz to 140 MHz as explained above.

Moreover, a regular broadcasting signal received through an antenna is applied to the switching section 26. The switching section 26 selects one of the broadcasting signals received through the antenna or the output signals from the mixer 24 according to a switch control signal SWC supplied from the microprocessor 32 of the set-top box master board 20A. The switch control signal is based on a view selection made by a user. Then, the distributor 28 distributes the output from the switching section 26 to a plurality of television sets 30A, 30B, ..., 30N, accordingly.

Consequently, a user watching one of the television sets 30A, 30B, ..., 30N can view different service contents (or VOD program) according to a channel selected by the user. For example, when the user of the television 30A uses the remote control of the set-top box to selectively elect the desired service contents to the television set 30A and selects the channel A using the remote control of the television set 30A, then the user can view the service contents provided through the RF modulator 22A. If the user selects channel B, then the user can view the service contents provided through the RF

modulator 22B.

As described above, a home network system of the present invention has an advantage in that although a plurality of users in respective rooms utilize a user equipment, i.e., a satellite broadcasting receiver connected to a network through one transmission media, they can view corresponding service contents through a plurality of display units. Furthermore, each of the plurality of users in the respective rooms can select a desired channel from N-channels simply by making a channel selection to view corresponding service contents.

While this invention has been described in connection with what is presently considered the most practical and the preferred embodiment, for example, a VOD service as an example of a two-way multimedia service, it should be understood that the invention is not limited to the disclosed embodiment. On the contrary, it is intended to cover various modifications within the spirit and the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A remote control apparatus coupled to a network for controlling the multi-media information presented to a viewer in a plurality of display units, comprising:

a plurality of interface boards coupled to said remote control device for converting signals received via a transmission media into corresponding service content signals;

a plurality of RF modulators coupled to said plurality of said interface boards for modulating said converted service content signals at different channel frequency bands, said different channel frequency corresponds to respective said plurality of said display units; and,

a mixing means coupled to each of said RF modulators for mixing said modulated signals from said plurality of said RF modulators to be applied to said plurality of said display units.

2. The apparatus according to Claim 1, further comprising:

a switching means coupled to said mixing means for selectively choosing the output signal from said mixing means or a broadcasting signal received via an antenna responsive to a request made by a user; and,

a distributor coupled to said switching means for distributing the output signal from said switching means to said plurality of said display units.

3. The apparatus according to Claim 2, wherein said RF modulators, said mixing means, and said switching means are included as a single module.

4. The apparatus according to Claim 1, wherein said interface boards comprise a plurality of set-top box boards.

5. The apparatus according to Claim 4, wherein said plurality of said set-top box boards comprises:

a set-top box master board coupled to said network via said transmission media; and,

a plurality of set-top box sub boards each coupled to said set-top box master board.

6. The apparatus according to Claim 5, wherein said set-top box master board comprises:

a network interface unit (NIU) coupled to said transmission media for interfacing with said network, said NIU coupled to said set-top box sub boards;

a first MPEG Decoder for decoding the output signals from said NIU into corresponding digital output signals;

a first audio and video output section for converting said digital output signals from said MPEG decoder into corresponding audio and video signals;

a first microprocessor coupled to said NIU and said MPEG decoder for controlling the overall operation of said set-top box master board;

a first memory means coupled to said microprocessor; and,

a user interface coupled to said microprocessor for interfacing with a user.

7. The apparatus according to Claim 6, wherein said set-top box master board interfaces with said user for selectively controlling the output signals of said switching means.

8. The apparatus according to Claim 6, wherein said network interface unit further comprising a receiver and a transmitter, said receiver demodulates said signals from said network using a Carrierless Amplitude Phase Modulation (CAP) method, and said transmitter modulates an upstream signal using a Quadrature Phase Shift Keying (QPSK) method to be outputted to said network via said transmission media.

9. The apparatus according to Claim 6, wherein said set-top box sub board comprises:

a second MPEG Decoder coupled to said NIU of said set-top box master board for decoding the output signals from said NIU into corresponding digital output signals;

a second audio and video output section for converting said digital output signals from said second MPEG decoder into corresponding audio and video signals;

a second microprocessor coupled to said first microprocessor of said set-top box master board for controlling the overall operation of said set-top box sub board; and,

a second memory means coupled to said second microprocessor.

10. The apparatus according to Claim 1, wherein said transmission media comprises an optical fiber, a coaxial cable, a twisted cable, or a satellite transmission.

11. A remote control apparatus coupled to a network for controlling the multi-media information presented to a viewer in a plurality of display units,

comprising:

a plurality of interface boards coupled to said remote control device for converting signals received via a transmission media into corresponding service content signals;

a plurality of RF modulators coupled to said plurality of said interface boards for modulating said converted service content signals at different channel frequency bands, said different channel frequency corresponds to respective said plurality of said display units;

a mixing means coupled to each of said RF modulators for mixing said modulated signals from said plurality of said RF modulators to be applied to said plurality of said display units;

a switching means coupled to said mixing means for selectively choosing the output signal from said mixing means or a broadcasting signal received via an antenna responsive to a request made by a user; and,

a distributor coupled to said switching means for distributing the output signal from said switching means to said plurality of said display units.

12. The apparatus according to Claim 11, wherein said RF modulators, said mixing means, and said switching means are included as a single module.

13. The apparatus according to Claim 11, wherein said interface boards comprises a plurality of set-top box boards.

14. The apparatus according to Claim 13, wherein said plurality of said set-top box boards comprises:

a set-top box master board coupled to said network via said transmission media; and,

a plurality of set-top box sub boards each coupled to said set-top box master board.

15. The apparatus according to Claim 14, wherein said set-top box master board comprises:

a network interface unit (NIU) coupled to said transmission media for interfacing with said network, said NIU coupled to said set-top box sub boards;

a first MPEG Decoder for decoding the output signals from said NIU into corresponding digital output signals;

a first audio and video output section for converting said digital output signals

from said MPEG decoder into corresponding audio and video signals;

a first microprocessor coupled to said NIU and said MPEG decoder for controlling the overall operation of said set-top box master board;

a first memory means coupled to said microprocessor; and,

a user interface coupled to said microprocessor for interfacing with a user.

16. The apparatus according to Claim 15, wherein said set-top box master board interfaces with said user for selectively controlling the output signals of said switching means.

17. The apparatus according to Claim 11, wherein said network interface unit further comprising a receiver and a transmitter, said receiver demodulates said signals from said network using a Carrierless Amplitude Phase Modulation (CAP) method, and said transmitter modulates an upstream signal using a Quadrature Phase Shift Keying (QPSK) method to be outputted to said network via said transmission media.

18. The apparatus according to Claim 15, wherein said set-top box sub board comprises:

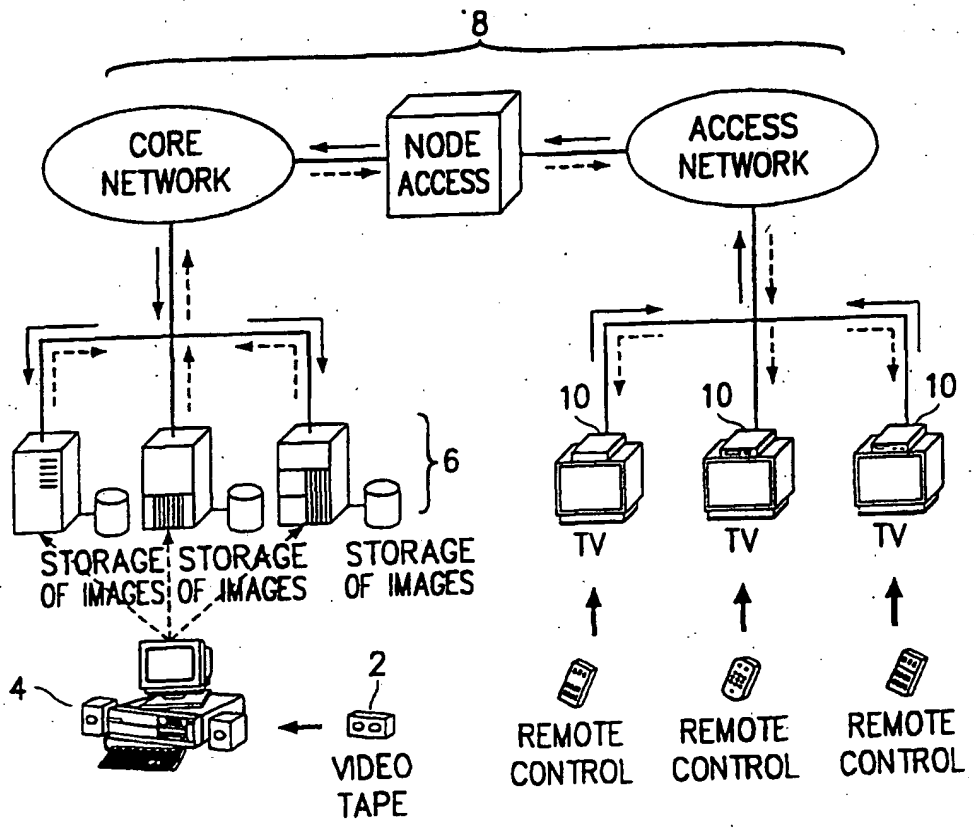
a second MPEG Decoder coupled to said NIU of said set-top box master board for decoding the output signals from said NIU into corresponding digital output signals;

a second audio and video output section for converting said digital output signals from said second MPEG decoder into corresponding audio and video signals;

a second microprocessor coupled to said first microprocessor of said set-top box master board for controlling the overall operation of said set-top box sub board; and,

a second memory means coupled to said second microprocessor.

19. The apparatus according to Claim 11, wherein said transmission media comprises an optical fiber, a coaxial cable, a twisted cable, or a satellite transmission.


8
CORE NETWORK
NODE ACCESS
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10
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TV
TV
TV
STORAGE OF IMAGES
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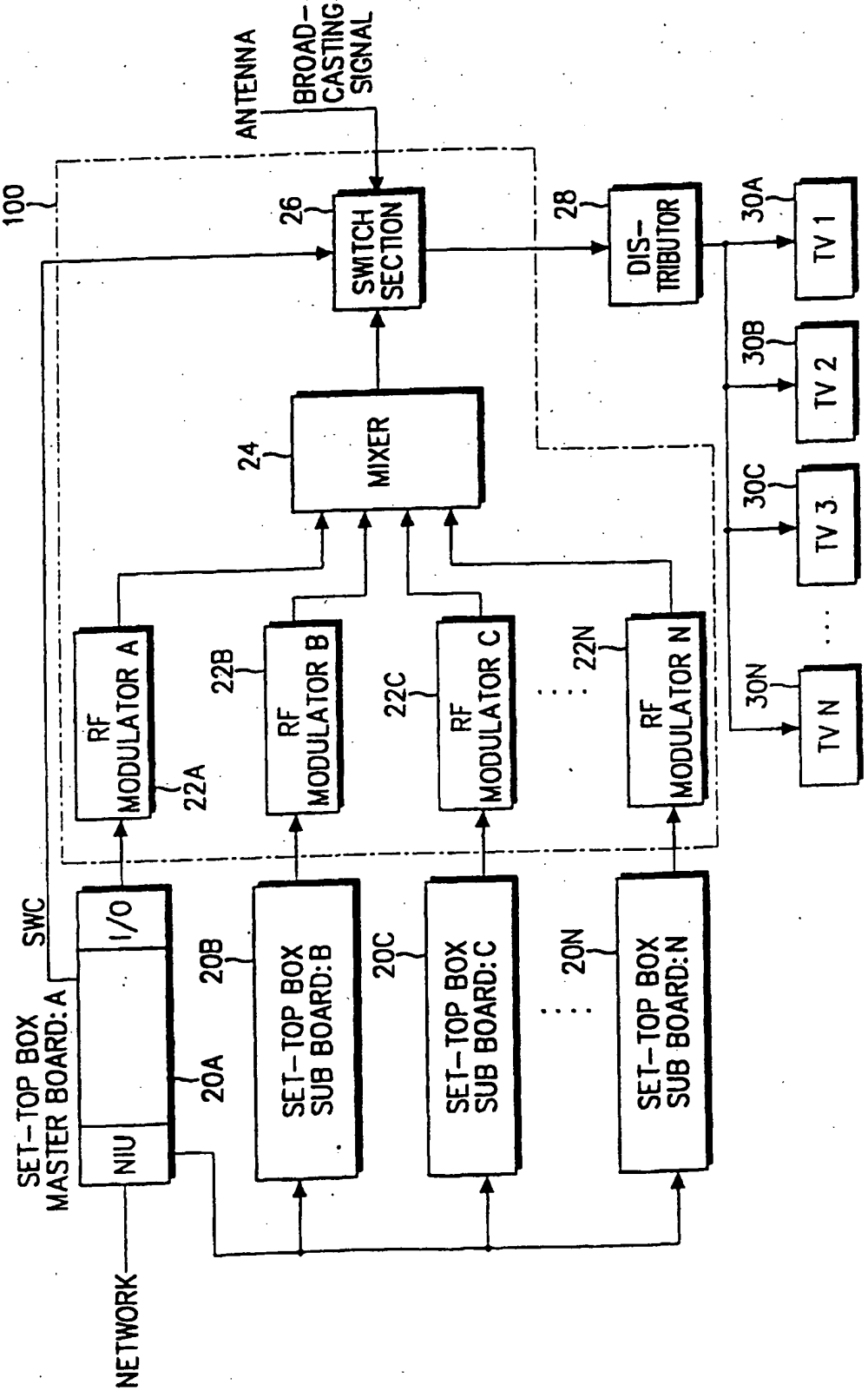
VIDEO TAPE
REMOTE CONTROL
REMOTE CONTROL
REMOTE CONTROL

FIG. 1

FIG. 2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TV N
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MIXER
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RF MODULATOR B
22B
RF MODULATOR C
22C
RF MODULATOR N
22N
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I/O
NIU
SWC
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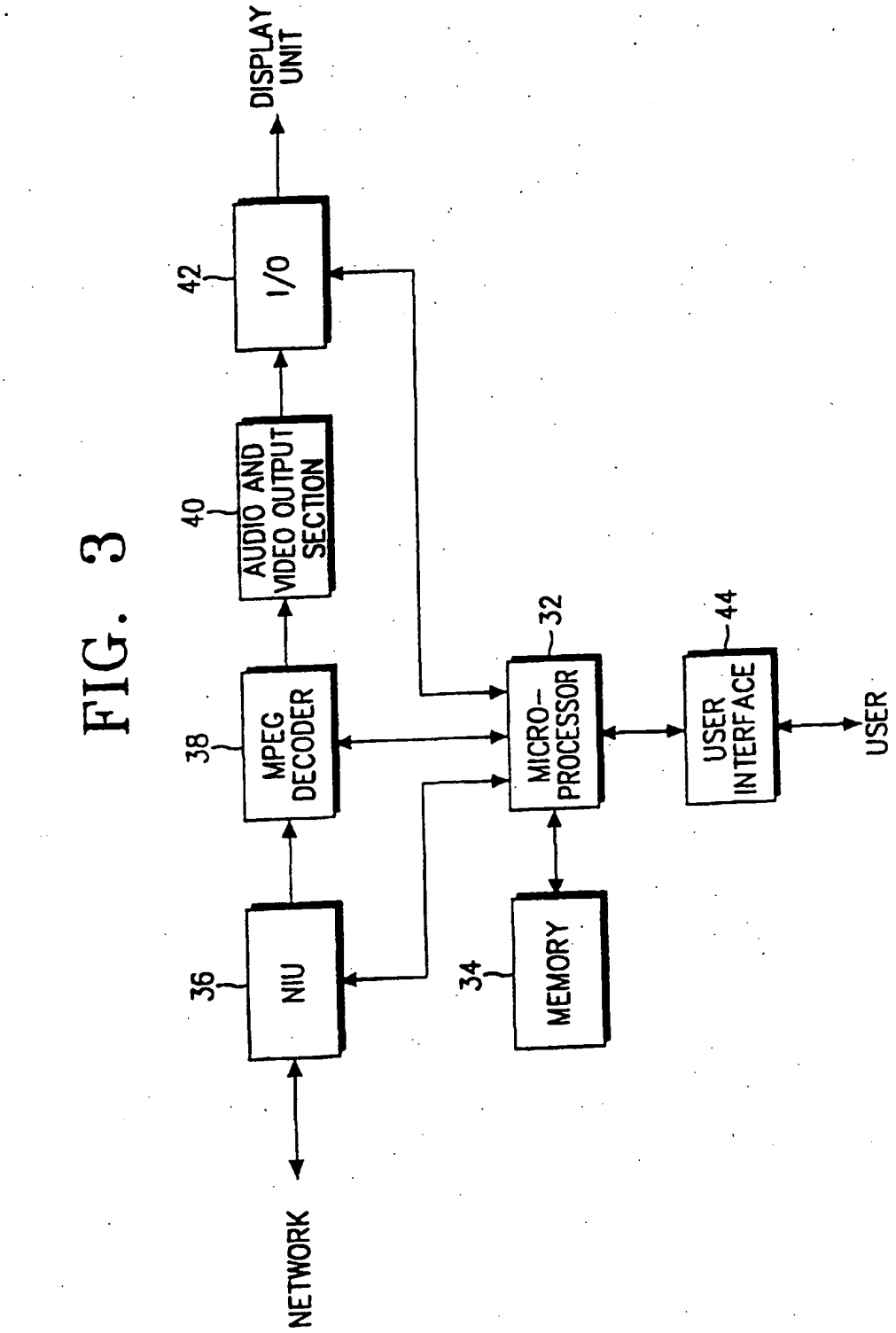
20B
SET-TOP BOX SUB BOARD: C
20C
SET-TOP BOX SUB BOARD: N
20N
NETWORK

FIG. 3


DISPLAY UNIT
42
I/O
40
AUDIO AND VIDEO OUTPUT SECTION
38
MPEG DECODER
36
NIU
NETWORK
32
MICRO-PROCESSOR
34
MEMORY
44
USER INTERFACE
USER

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR00/00751

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 H04L 12/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimun documentation searched (classification system followed by classification symbols)

IPC7:H04L, H04N, H04Q

Documentation searched other than minimun documentation to the extent that such documents are included in the fileds searched

Korean Patents and Applications for Inventions since 1975
Korean Utility Models and Applications for Utility Models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

IEL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	5,682,597 : Abstract, Figure 1, 3, 4 Column 6, 50-65	1-2, 7
A	5,721,829 : Abstract, Figure 1, 6 Claim 9, Column 7, 43-55	1-2, 7
A	5,920,800 : Abstract, Figure 1- 5	6-9
A	Electrotechnical Conference, 1996, MELECON '96., 8th Meditarranean pp.1031-1034 , Vol.2, Braye G.;Froidure J. C.;Blondel M. "Impact of clipping distortions on hybrid AM-VSB/16 QAM CATV systems"	1-9

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
24 OCTOBER 2000 (24.10.2000)	25 OCTOBER 2000 (25.10.2000)

Name and mailing address of the ISA/KR	Authorized officer
Korean Industrial Property Office Government Complex-Taejon, Dunsan-dong, So-ku, Taejon Metropolitan City 302-701, Republic of Korea Facsimile No. 82-42-472-7140	LEE, Saang Woong Telephone No. 82-42-481-5714

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/KR00/00751

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